CURRICULUM VITAE

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Education

B.S. (with honors and distinction), in Botany, The University of Michigan, Ann Arbor, 1983.

M.S., in Plant Biology, The University of Michigan, Ann Arbor, 1988.

Ph.D., in Quantitative Ecology and Resource Management, University of Washington, Seattle, 1994.

Research Interests

Growth and Bioenergetics. Developing models of growth and bioenergetics in response to varying habitat conditions.

Response of populations to climate. Impacts of climate variability and climate change on natural populations.

Migrational Behavior. Models of dispersal patterns in natural populations. Variability of migration-related life history traits among closely-related taxa.

Survival and Selection Processes in Natural Populations. Patterns of population survival and selection related to individually-varying phenotypic traits

Population Dynamics and Life Cycle Modeling. Using demographic population viability analyses to assess impacts to populations. Detecting density dependence in natural populations.

Ecosystem-Based Management. Impacts of fishing on marine communities.

Research experience and Employment

June 2005 to present: Supervisory Mathematical Statistician, Fish Ecology Division, Northwest Fisheries Science Center, National marine Fisheries Service. Team Leader of the Quantitative Ecology Team.

September 1999 to June 2005: Mathematical Statistician, Fish Ecology Division, Northwest Fisheries Science Center, National Marine Fisheries Service. Research on survival and behavior of threatened and endangered salmonid species including developing models of population dynamics and spatial patterns, and conducting survival studies. Other areas of research include Population Viability Analysis and Ecosystem modeling.

July 1997 to September 1999: Research Consultant, Columbia Basin Research, School of Fisheries, University of Washington. Research on salmon survival issues including participation in the Plan for Analyzing Testable Hypotheses (PATH) process, a multiple agency research effort to recommend measures to recover endangered stocks of salmon.

January 1995 to June 1997: Post Doctoral Research Associate, School of Fisheries, University of Washington. Worked with Professor James Anderson developing and calibrating models of salmonid migration.

March 1994 to December 1994: Research Consultant, Center for Quantitative Science, University of Washington.

September 1988 to February 1994: Research Assistant, Quantitative Ecology and Resource Management Graduate Program, University of Washington.

January 1985 - June 1988: Graduate student and Teaching Assisitant, Department of Biology, University of Michigan. Research on the systematics, genetics and ecology of plant populations.

Publications

Gurarie, E., J.J. Anderson, and R.W. Zabel. *Accepted pending revision*. Incorporating population heterogeneity into analysis of dispersal and movement. Ecology.

Zabel, R.W., J. Faulkner, S.G. Smith, J.J. Anderson, C. Van Holmes, N. Beer, S. Iltis, J. Krinke, G. Fredricks, B. Bellerud, J. Sweet, A. Giorgi. 2008. Comprehensive Passage (COMPASS) Model: a model of downstream migration and survival of juvenile salmonids through a hydropower system. Hydrobiologia 609: 289-300.

Zabel, R. W., B. J. Burke, M. L. Moser, C. A. Peery. 2008. Relating dam passage time of adult salmon to varying river conditions using time-to-event analysis. American Fisheries Society Symposium 61: 153-163.

Waples, R.S., R.W. Zabel, M.D. Scheuerell, and B.L. Sanderson. 2008. Evolutionary responses by Pacific salmon to ecological changes associated with the Columbia River hydropower system. Molecular Ecology **17**, 84–96.

Crozier, L.G., R.W. Zabel, A.F. Hamlet. 2008. Predicting differential effects of climate change at the population level with life-cycle models of spring Chinook salmon. Global Change Biology 14, 236–249.

Ferguson, J., G. Ploskey, K. Leonardsson, R.W. Zabel, and H. Lundqvist. 2008. Combining turbine blade strike and life cycle models to rapidly assess mitigation strategies for fish passing dams. Canadian Journal of Fisheries and Aquatic Sciences 65: 1568-1585.

Williams, J. G., R. W. Zabel, R. S. Waples, J. A. Hutchings and W. P. Connor. 2008. Potential for anthropogenic disturbances to influence evolutionary change in the life history of a threatened salmonid. Evolutionary Applications 1: 271–285.

Achord, S., R. W. Zabel, B. Sandford, and J. G. Williams. 2007. Migration timing and estimated parr-to-smolt survival rates of wild Snake River spring/summer Chinook salmon smolts from Idaho at Lower Granite Dam. Trans. Amer. Fish. Soc. 136: 142-154.

Caudill C. C. W. R. Daigle, M. L. Keefer, C. T. Boggs, M. A. Jepson, B. J. Burke, R. W. Zabel, T. C. Bjornn, and C. A. Peery. 2007. Slow dam passage in Columbia River salmonids associated with unsuccessful migration: delayed negative effects of passage obstacles or condition-dependent mortality? Canadian Journal of Fisheries and Aquatic Sciences 64: 979-995.

Zabel, R. W., M. D. Scheuerell, M. M. McClure, and J. G. Williams. 2006. The interplay between climate variability and density dependence in the population viability of Chinook salmon. Conservation Biology 20(1):190-200.

Crozier, L. G., R. W. Zabel. 2006. Climate impacts at multiple scales: Evidence for differential population responses in juvenile Chinook salmon. Journal of Animal Ecology 75: 1100-1109.

C. A. Morgan, C. A., A. De Robertis, R. W. Zabel. 2005. Columbia River plume fronts: I Hydrography, zooplankton distribution, and community composition. Marine Ecology Progress Series 299: 19-31.

De Robertis, A., C. A. Morgan, R. A. Schabetsberger, R. W. Zabel, R. D. Brodeur, R. L. Emmett, C. M. Knight, G. Krutzikowsky, E. Casillas. 2005. Columbia River plume fronts: II Distribution, abundance and feeding ecology of juvenile salmon. Marine Ecology Progress Series 299: 33-44.

Zabel, R.W., T. Wagner, J. L. Congleton, S. G. Smith, and J. G. Williams. 2005. Survival and selection of migrating salmon from capture-recapture models with individual traits. Ecological Applications 15: 1427-1439.

Anderson, J. J., E. Gurarie, and R. W. Zabel. 2005. Mean free-path length theory of predator-prey interactions: application to juvenile salmon migration. Ecological Modeling 186: 196-211.

Moser, M. L., R. W. Zabel, B. J. Burke, and L. C. Stuehrenberg. 2005. Factors affecting adult Pacific lamprey passage rates at hydropower dams: using "time to event" analysis of radiotelemetry data. Pages 61-70 *In* M. T. Spedicato, G. Marmulla, and G. Lembo (eds.) Aquatic Telemetry: advances and applications. FAO-COISPA, Rome.

M. D. Scheuerell, P. S. Levin, R. W. Zabel, J. G. Williams, and B. L. Sanderson. 2005. A new perspective on the importance of marine-derived nutrients to threatened stocks of Pacific salmon (*Oncorhynchus* spp.). Canadian Journal of Fisheries and Aquatic Sciences 62: 961-964.

Zabel, R. W., and S. Achord. 2004. Relating size of individuals to juvenile survival within and among closely-related populations of chinook salmon. Ecology 85: 795-806.

Zabel, R. W., C. J. Harvey, S. L. Katz, T. P. Good, and P. S. Levin. 2003. Ecologically sustainable yield. American Scientist 91: 150-157.

Achord, S., P. S. Levin, and R. W. Zabel. 2003. Density-dependent mortality in Pacific salmon: the ghost of impacts past? Ecology Letters 6: 335-342.

S.G. Smith, S.G., W.D. Muir, E.E. Hockersmith, R.W. Zabel, R.J. Graves, C.V. Ross, W.P. Connor, and B.D. Arnsberg. 2003. Influence of river conditions on survival and travel time of Snake River fall chinook salmon. North American Journal of Fisheries Management 23: 939-961.

Zabel, R. W. 2002. Using "travel-time" data to characterize the behavior of migrating animals. American Naturalist 4:372-387.

Zabel, R. W., and P. S. Levin. 2002. Simple assumptions on age composition lead to erroneous conclusions on the nature of density dependence in age-structured populations. Oecologia 133: 349-355.

Zabel, R. W., and J. G. Williams. 2002. Selective mortality in chinook salmon: what is the role of human disturbance? Ecological Applications 12: 173-183.

Levin, P. S., S. Achord, B. E. Feist, and R. W. Zabel. 2002. Non-indigenous brook trout and the demise of Pacific salmon: a forgotten threat? Proceedings of the Royal Society of London (B) 269: 1663-1670.

Levin, P. S., R. W. Zabel, and J. G. Williams. 2001. The road to extinction is paved with good intentions: negative association of fish hatcheries with threatened salmon. Proceedings of the Royal Society of London (B) 268: 1153-1158.

Zabel, R. W., and J. G. Williams. 2000. Comments on "Contrasting patterns of productivity and survival rates for stream-type chinook salmon (*Oncorhynchus tshawytscha*) populations of the Snake and Columbia rivers" by Schaller et al. (1999). Canadian Journal of Fisheries and Aquatic Sciences 57: 1739-1741.

Zabel, R.W., J.J. Anderson, and P.A. Shaw. 1998. A multiple reach model describing the migratory behavior of Snake River yearling chinook salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences 55: 658-667.

Zabel, R.W., and J.J. Anderson. 1997. A model of the travel time of migrating juvenile salmon, with an application to Snake River spring chinook salmon. North American Journal of Fisheries Management, 17: 93-100.

Selected Technical Reports, Conference Proceedings, and Dissertation

Williams, J. G., S. G. Smith, R. W. Zabel, W. D. Muir, M. D. Scheuerell, B. P. Sandford, D. M. Marsh, R. A. McNatt, S. Achord. 2005. Effects of the Federal Columbia River Power System on Salmonid Populations. U.S. Dept. of Commerce, NOAA Tech. Memo., NMFS-NWFSC-63, 150 p.

Zabel, R. W. 2002. Characterizing migrational delay of adult salmon at dams using time-to-event analyses. Pages 35-39 *In* J. Chech Jr., C. Swanson, P. S. Young, and D. MacKinley (eds.), Proceedings of the Fish Passage Symposium, International Congress of the Biology of Fish, Vancouver, B. C., 2002.

Zabel, R. W., S. G. Smith, W. D. Muir, D. M. Marsh, J. G. Williams, and J. R. Skalski. 2002. Survival estimates for the passage of spring-migrating juvenile salmonids through Snake and Columbia River dams and reservoirs, 2001. Report to Bonneville Power Administration, Contract DE-AI79-93BP10891.

Zabel, R. W., S. G. Smith, W. D. Muir, D. M. Marsh, J. G. Williams, and J. R. Skalski. 2001. Survival estimates for the passage of Spring-Migrating Juvenile Salmonids through Snake and Columbia River dams and reservoirs, 2000. Report to Bonneville Power Administration, Contract DE-AI79-93BP10891. (Available from Northwest Fisheries Science Center, 2725 Montlake Blvd. E., Seattle, WA 98112-2097.).

Smith, S. G., W. D. Muir, G. Axel, R. W. Zabel, J. G. Williams, and J. R. Skalski. 2000. Survival estimates for the passage of juvenile salmonids through Snake and Columbia River dams and reservoirs, 1999. Report to Bonneville Power Administration, Contract DE-AI79-93BP10891, 80 p. (Available from Northwest Fisheries Science Center, 2725 Montlake Blvd. E., Seattle, WA 98112-2097.)

Zabel, R. W. 2000. Modeling the migratory behavior of juvenile salmon: what processes govern downstream movement? Proceedings of the International Fish Biology Congress, Aberdeen, Scotland, 2000.

Zabel, R.W., J.J. Anderson, and J.A. Hayes. 1998. Calibration and validation of the Columbia River Salmon Passage (CRiSP) Model. In E. L. Brannon and W.C. Kinsel Editors, Proceedings of the Columbia River Anadromous Salmonid Rehabilitation and Passage Symposium, June5-7,

1995. Aquaculture Research Institute, University of Idaho.

Zabel, R. W. 1994. Spatial and Temporal Models of Migrating Juvenile Salmon with Applications. Ph.D. dissertation, University of Washington, Seattle.

Teaching experience

1994 and 1995: Lecturer, University of Washington. Taught Statistical Inference in Applied Research.

January 1985 to June 1988: Teaching Assistant, University of Michigan. Taught the following courses: Introductory Biology, Writing for Biologists, Plant Systematics, Biology of World Hunger, Plant Biology, General Ecology, and Genetics.

Talks delivered at Annual Meetings

Fisheries and the Environment (2007)

European Inland Fisheries Advisory Commission (2006).

American Society of Limnology and Oceanography, 2005 (Invited speaker).

Western Society of Naturalists, 2004, 2005 (Invited Symposium Speaker).

Society for Conservation Biology, 2001.

International Fish Biology Congress, 2000, 2002.

Biometrical Society, Western North American Region, 1999 (Invited speaker).

Ecological Society of America, 1993, 1995, and 2004 (presider).

Resource Modeling Association, 1990 and 1998.

Honors, Fellowships, Awards

College Honors Program, 1979-1981, University of Michigan.

Honors Concentration Program, 1983, University of Michigan.

Mellon Foundation Fellowship to attend the Naturalist-Ecologist Training Program, University of Michigan Biological Station, 1985.

Special Act Award, 2005, Northwest Fisheries Science Center.

Service

Guest Subject Matter Editor: Ecological Applications.

Reviewer for the following peer-reviewed journals: Proceedings of the National Academy of Science, Proceedings of the Royal Society of London *B*, Ecology, Ecological Applications, Ecology Letters, Journal of Applied Ecology, Journal of Animal Ecology, Frontiers in Ecology and the Environment, Oikos, Canadian Journal of Fisheries and Aquatic Sciences, Transactions of the American Fisheries Society, North American Journal of Fisheries Management, Fisheries, Amercian Fisheries Society Symposium, Journal of Experimental Marine Biology and Ecology, Environmental Modelling and Software, Hydrobiologia.

Reviewer for the Millennium Ecosystem Assessment

Scientific Review Committee (SRC) for the Cooperative Monitoring and Research Committee, established by the Washington State Board of Natural Resources

Reviewed reports and proposals for: NSF, CALFED, Bonneville Power Administration, Chelan County PUD, ODFW, NOAA Northwest Regional Office, University of Washington

Oversight Committee: Acoustic tag design and development team, Chelan County PUD
Committee member: Computer committee, Northwest Fisheries Science Center
Reviewer for NWFSC internal grants program

Advising/Mentoring

Master's Thesis Committee: Erica Alston, Clark University, Atlanta (graduated 2004).
National Research Council (NRC) Postdoctoral adviser for Lisa Crozier (2004-2007).
Oak Ridge Institute for Science and Education Mentor for Kerri Haught (2005-2006).
Dissertation Supervisory Committee: Eli Gurarie (graduated 2008), University of Washington.
Master's Supervisory Committee: Kara Cromwell (2006 – present), University of Idaho
Master's Supervisory Committee: Jessica Beetz (2007 – present), University of Washington